DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the manufacturing method of a photocatalyst body and a photocatalyst body, the coating liquid for foundation layers of a photocatalyst body and the coating liquid for photocatalyst membrane provided with the photocatalyst membrane of room-temperature-setting nature, and the functional body using this.
[0002]
[Description of the Prior Art]**************** which uses photocatalyst membrane in order to perform deodorization, antifouling, and/or antibacterial properties.
[0003]If the light energy is absorbed in response to UV irradiation, an electron and a hole will generate photocatalyst membrane to the semiconductor which constitutes photocatalyst membrane and presents a photocatalyst effect. An electron and a hole react to oxygen and water in a membrane surface, produce active oxygen, a radical [activity / others], etc., carry out oxidation reduction of the dirt which consists of organic matters, or the stinking thing ingredient, and decompose.
[0004]It is titanium oxide that promising ** is most carried out among substances with a photocatalyst effect now. While the photocatalyst effect of titanium oxide is remarkable, it is because it is safe, it is a rational price industrially and it is a substance which can moreover obtain an initial complement.
[0005]Recently, the motion which is going to form photocatalyst membrane in broad articles, such as building materials, a light, and a lamp, paying attention to the usefulness of photocatalyst membrane is active.
[0006]Although it is in the manufacturing method of photocatalyst membrane variously, the dip method and the ultrafine particle dispersion-liquid coating method are generally used.
[0007]A dip method is the method of applying the coating liquid containing the alkoxide of

titanium, calcinating at the temperature of 400-500 **, and forming photocatalyst membrane, when it is titanium oxide, metaled alkoxide, for example, photocatalyst membrane, which constitute photocatalyst membrane in a base. Since it excels in film strength, the photocatalyst membrane obtained by this manufacturing method is durable.

[0008]An ultrafine particle dispersion-liquid coating method is a method of applying to a base the dispersion liquid which distributed the light catalytic ultrafine particle of titanium oxide etc. in the solvent which consists of water, isopropyl alcohol, etc., calcinating them, and obtaining photocatalyst membrane. The photocatalyst membrane obtained by this manufacturing method has high crystallinity, and it is excellent in light catalytic.

[0009]On the other hand, the photocatalyst body using the binding material of room-temperature-setting nature is also developed, and photocatalyst membrane can be comparatively formed now in the base of non-refractoriness at low temperature.

[0010]

[Problem(s) to be Solved by the Invention]There is a problem that its crystallinity in a membrane surface is not enough, and light catalytic is low if the photocatalyst membrane obtained by the dip method is not calcinated at an elevated temperature for a long time. Since in the case of soft glass, such as soda lime glass, the softening temperature of glass is comparatively low and a base cannot calcinate at a necessary elevated temperature, it is difficult to obtain light catalytic [sufficient].

[0011]On the other hand, in the photocatalyst membrane obtained by the ultrafine particle dispersion-liquid coating method, and the photocatalyst membrane using the binding material of room-temperature-setting nature, it is a stake for fully acquiring adhesion with the base of photocatalyst membrane. When the binding material of the quality of organicity is used, it is easy to generate a crack in the binding material. A crack occurs in photocatalyst membrane also according to desiccation of a foundation layer being insufficient. Thus, when a crack occurs, there is a problem that decline in transmissivity occurs by nebula etc.

[0012]An object of this invention is to provide the manufacturing method of the photocatalyst body of room-temperature-setting nature with high bond strength, photocatalyst effect, and photocatalyst membrane intensity, and a photocatalyst body, the coating liquid for foundation layers of a photocatalyst body, the coating liquid for photocatalyst membrane, and the functional body using this.

[0013]

[Means for Achieving the Goal]A photocatalyst body of an invention of claim 1 A base,;aluminum, Zr, Si, Ti, Zn, A metallic-oxide ultrafine particle with a mean particle diameter of 10-100 nm which consists of an oxide of a kind chosen from a group of Mg, Y, In, Sn, Ta, and Sb or two or more sorts of metal is bound with a binding material which makes Si compound a subject, A light catalytic metallic-oxide ultrafine particle which makes a subject a

titanium oxide ultrafine particle whose porosity surface at least foundation layer and; mean particle diameter which were allocated on the surface of a base are smaller than mean particle diameter of metallic-oxide length particles of a foundation layer is bound with a room-temperature-setting nature binding material, It is characterized by providing photocatalyst membrane allocated on a foundation layer, and;.

[0014]In this invention and each following invention, unless it specifies in particular, a definition of term and a technical meaning are based on the next.

[0015]About < base, > base supports photocatalyst membrane and permits chiefly that it is what is originally formed for other functions aiming at support of photocatalyst membrane (henceforth a "functional body") not to mention a member aiming at support of photocatalyst membrane.

[0016]As a functional body, members of various arbitrary requests, such as interior materials, such as building materials, such as a tile, a windowpane, and a ceiling panel, wallpaper, and a curtain, an object for kitchens and equipment for health, electrical household appliances and electrical equipment, lighting appliance material, an object for deodorization, or a filter for dust collection, can be used as a base, for example.

[0017]While using not only a fireproof material of metal, glass, ceramics (porcelain is included.), earthenware, a stone, etc. but also photocatalyst membrane of room-temperature-setting nature as a material of a base, It can use by making a porosity foundation layer into room-temperature-setting nature, inflammable materials, i.e., bases of non-refractoriness, such as a synthetic resin, wood, paper, and cloth.

[0018]About < foundation layer, > foundation layer intervenes between photocatalyst membrane and a base, and it is used in order to improve the adhesion of photocatalyst membrane or to improve the optical property of a photocatalyst body. Therefore, a foundation layer is formed on the surface of a base, before forming photocatalyst membrane.

[0019]Since the surface is porosity at least, a foundation layer used in this invention will be entered by photocatalyst membrane in unevenness formed on the surface of a foundation layer for porosity, if photocatalyst membrane is formed on the foundation layer.

[0020]A foundation layer aluminum, Zr, Si, Ti, Zn, Mg, Y, In, It consists of a metallic oxide of a group of Sn, Ta, and Sb, a selected kind, or two or more sorts of metal, and, as for mean particle diameter of 10-100 nm, the surface is suitably formed in porosity at least by binding Si compound with a binding material made into a subject in a 10-40-nm ultrafine particle. As for this porosity, a mole ratio is suitably set as 40 to 90% of range. If mean particle diameter of a metallic-oxide ultrafine particle exceeds 100 nm, while a foundation layer will become cloudy easily, a mechanical strength falls and it becomes weak.

[0021]Thus, since a foundation layer comprises a metallic oxide, it is generally provided with transparency, and since affinity with photocatalyst membrane which uses as the main

ingredients a titanium oxide ultrafine particle moreover mentioned later is good, it can make photocatalyst membrane adhere to a base firmly.

[0022]Even if there are few foundation layers, in order to make the surface into porosity and to form a rugged surface, By any means, although it is good, since mean particle diameter of a metal oxide particle is larger than mean particle diameter of an ultrafine particle of titanium oxide which constitutes photocatalyst membrane, a dent and an opening produce between metal oxide particles, and, thereby, the surface becomes porosity at least.

[0023]Next, in order to bind a metal oxide particle, a binding material which makes Si compound a subject is used. And a foundation layer can be formed by adjusting coating liquid distributed in a solvent containing a binding material formation material which forms a binding material for a metal oxide particle, applying to the surface of expectation of this, and generally calcinating 15-300 ** in 80-300 ** preferably. However, a binding material which makes a subject Si compound of room-temperature-setting nature can also be used. As a binding material which makes a subject Si compound of room-temperature-setting nature, a thing which was chosen from a group who consists of organosilane oligomer containing the ORGANO mono silane and a methyl group which contain a methyl group, for example and which added a curing catalyst can be used for a kind at least. it was chosen from a group who consists of acid, alkali, a zinc compound, a titanium compound, and a zirconium compound, for example as a curing catalyst -- a kind can be used at least. Coating liquid which makes a binding material solution which consists of a constituent which blended polysilazane and an oxidation catalyst with an organic solvent which does not have an OH radical come to distribute a metallic-oxide ultrafine particle can be adjusted, on a foundation layer, it applies, and it can dry and a foundation layer can also be formed. As a foundation layer was mentioned above, when forming using a binding material of room-temperature-setting nature, it can constitute so that it may harden at 15-100 **. As a method of applying coating liquid to a base, a spray coating method, the dip-coating method, the flow coating method, the roll coating method, the spin coating method, brush painting, the sponge applying method, etc. are employable.

[0024]A metal oxide particle which constitutes a foundation layer, According to the refractive index being smaller than a refractive index of photocatalyst membrane, a foundation layer which has a middle refractive index of a base with a small refractive index and photocatalyst membrane with a big refractive index, for example like soda lime glass can be formed, and tilted structure of a refractive index can be realized. By using tilted structure, a difference of a refractive index between a base and a foundation layer which contact mutually, and photocatalyst membrane can be made small, and generating of light interference can be controlled.

[0025]A foundation layer can be formed in thickness of an arbitrary request further again. For

example, a foundation layer (50 nm - several micrometers) can be obtained easily.
[0026]> photocatalyst material makes an ultrafine particle of titanium oxide TiO_2 a subject about < photocatalyst membrane. While a photocatalyst effect is remarkable, it is safe and titanium oxide is a rational price industrially, and since an initial complement can moreover be obtained, promising ** of it is most carried out as photocatalyst material now.
[0027]There are a rutile form and an anatase form in titanium oxide as the crystal structure. It is said that a photocatalyst effect is excellent in a direction of an anatase form. Therefore, in this invention, it is preferred to use titanium oxide of an anatase form. However, a rutile form is mixed and formed in an anatase form in practice in many cases, and moreover, since a practical photocatalyst effect can be obtained even if both the above-mentioned crystal structures are intermingled when using an ultrafine particle of titanium oxide, a mode which both mixed is permitted in this invention. The resolvability of an organic matter changes with how of those mixture ratio.
[0028]In this invention, light catalytic metallic-oxide ultrafine particles other than an ultrafine particle of titanium oxide may be added as an accessory constituent in photocatalyst membrane. There are the following as other photocatalyst material. WO_3, $LaRhP_3$, $FeTiO_3$, Fe_2O_3, $CdFe_2O_4$, $SrTiO_3$, CdSe, GaAs, They are GaP, RuO_2, ZnO, CdS, MoS_3, $LaRhO_3$, $CdFeO_3$, Bi_2O_3, MoS_2, In_2O_3, CdO, SnO_2, etc. One sort or two or more sorts can be mixed, and these substances can be used.
[0029]TiO_2, WO_3, $SrTiO_2$, Fe_2O_3, CdS, MoS_3, Bi_2O_3, Since redox of an equivalent-electrons belt, the potential absolute value of MoS_2, In_2O_3, and CdO, etc. are larger than redox of a conducting zone, and a potential absolute value, The oxidizing power is larger than reducing power, and it excels in a deodorization operation by disassembly of an organic compound, an antifouling operation, or an antibacterial action. In a field of material cost, Fe_2O_3 and ZnO are excellent in each above-mentioned substance.
[0030]In this invention, mean particle diameter uses suitably 10 nm or less of titanium oxide ultrafine particles in a form of a 4-10-nm particle further again. And if possible, the shape is close to a globular form, moreover the above-mentioned ultrafine particle has little dispersion in particle diameter, and it is preferred that they are good crystalline particles.
[0031]A light catalytic metallic-oxide ultrafine particle which makes a subject the above-mentioned titanium oxide ultrafine particle is bound by a binding material of room-temperature-setting nature, and photocatalyst membrane is formed further again. As a binding material of room-temperature-setting nature, a thing which was chosen from a group who consists of organosilane oligomer containing the ORGANO mono silane and a methyl group which contain a methyl group, for example and which added a curing catalyst can be used for a kind at least.

it was chosen from a group who consists of acid, alkali, a zinc compound, a titanium compound, and a zirconium compound, for example as a curing catalyst -- a kind can be used at least. Coating liquid which distributed a titanium oxide ultrafine particle can be adjusted to a binding material solution which consists of a constituent which blended polysilazane and an oxidation catalyst with an organic solvent which does not have an OH radical, on a foundation layer, it applies, and it can dry and photocatalyst membrane can also be formed. When forming photocatalyst membrane using a room-temperature-setting nature binding material, it can constitute so that it may harden at 15-100 **. In order to adjust coating liquid which consists of a binding material formation material and a solvent which form a light catalytic metallic-oxide ultrafine particle and a room-temperature-setting nature binding material and to apply this on a foundation layer, either of various methods which were under explanation about a foundation layer and were described is employable.

[0032]Thus, in that case, obtained photocatalyst membrane is entered and stuck in a rugged surface of the surface of a foundation layer, when [of a foundation layer] the surface is porosity at least. This structure applies dispersion liquid of photocatalyst membrane on a porosity surface for example at least foundation layer, and if it dries, it can form them easily.

[0033]A method according to mechanical pressure for accumulating to make an ultrafine particle of titanium oxide enter certainly in a rugged surface of a foundation layer further again can be added. This method applies mechanical pressure from on a coating layer of an ultrafine particle of titanium oxide, and pushes it in into a foundation layer.

[0034]Further again, while demonstrating a photocatalyst effect to a request the range of 130-200 nm, and by forming in about 150 nm the optimal, manufacture is easy and a crack becomes difficult, as for photocatalyst membrane, to produce 100-500 nm of the thickness suitably.

[0035]Since photocatalyst membrane is colored when photocatalyst membrane adds and forms organic system coloring matter, for example, methylene blue etc., in coating liquid, existence of photocatalyst membrane and distinction of a state become easy further again. Thereby, an application state of photocatalyst membrane can observe now easily by viewing. It seems that and the marketability of a photocatalyst body is not reduced since it is decomposed, and organic system coloring matter disappears and becomes transparent by once irradiating with ultraviolet rays.

[0036]Since photocatalyst membrane has entered and stuck to a rugged surface formed in the surface in > this invention by [of a foundation layer] being porosity at least since the surface is formed in porosity at least about an operation of < invention, bond strength of photocatalyst membrane becomes large. Since a foundation layer is binding a metal oxide particle with a binding material which makes Si compound a subject, it can be easily made into porosity.

[0037]Since photocatalyst membrane is binding a light catalytic metallic-oxide ultrafine particle

which makes an ultrafine particle of titanium oxide a subject with a room-temperature-setting nature binding material and it can be hardened at ordinary temperature, it can obtain a photocatalyst body using a base of inflammable construction material.
[0038]Since photocatalyst membrane makes an ultrafine particle of titanium oxide a subject, a strong photocatalyst effect is obtained.
[0039]Its bond strength to a foundation layer is strong while film strength of photocatalyst membrane improves, since it is hard to produce a crack.
[0040]Since coating liquid which distributed further again a light catalytic metallic-oxide ultrafine particle which makes titanium oxide a subject is made to laminate on a foundation layer and it is obtained by hardening of a room-temperature-setting nature binding material, manufacture is easy.
[0041]Since metallic oxides, such as silicon oxide whose refractive index is smaller than that of photocatalyst membrane, and an aluminum oxide, are used further again as a metallic oxide which constitutes a foundation layer, a refractive index serves as a photocatalyst body arranged in inclination, and generating of light interference can be prevented. For this reason, transmissivity of photocatalyst membrane improves and a high photocatalyst body of transparency is obtained.
[0042]A photocatalyst body of an invention of claim 2 A base,;aluminum, Zr, Si, Ti, Zn, Consist of an oxide of a kind chosen from a group of Mg, Y, In, Sn, Ta, and Sb, or two or more sorts of metal, and by within the limits whose mean particle diameter is 10-100 nm. And where a metal oxide particle from which mean particle diameter differs in two or more sorts is mixed, Si compound is bound with a binding material made into a subject, A light catalytic metallic-oxide ultrafine particle which makes a subject a titanium oxide ultrafine particle whose foundation layer and; mean particle diameter which were allocated on the surface of a base are smaller than mean particle diameter of a metallic-oxide ultrafine particle of a foundation layer is bound with a room-temperature-setting nature binding material, It is characterized by providing photocatalyst membrane allocated on a foundation layer, and;.
[0043]This invention has specified composition with which a foundation layer was further improved as compared with claim 1.
[0044]That is, while a metal oxide particle in a foundation layer is within the limits with a mean particle diameter of 10-100 nm, mean particle diameter differs in two or more sorts. For example, a metal oxide particle with a mean particle diameter of 20 nm and a metal oxide particle with a mean particle diameter of 60 nm are being mixed. Distribution of particle diameter in the above-mentioned mean particle diameter of a metal oxide particle, The 1st particle diameter group in which half breadth is carrying out the normal distribution to the range of 15-25 nm with a peak of particle diameter of 20 nm in this case approximately [that] although it can be made about **5 nm with half breadth to mean particle diameter in many

cases, It consists of the 2nd particle diameter group in which half breadth is carrying out the normal distribution to the range of 55-65 nm with a peak of particle diameter of 60 nm approximately [the]. However, in this invention, the particle-size-distribution range of half breadth in mean particle diameter may have width narrower than the above-mentioned example, and may be wide.

[0045]A kind and two or more sorts of any may be sufficient as a kind of metal oxide particle in a foundation layer. When using two or more sorts of metal oxide particles, a kind of metal oxide particle can be changed for every mean particle diameter, and two or more sorts of metal oxide particles can be used for every mean particle diameter.

[0046]In this invention, in order to judge mean particle diameter of a metal oxide particle contained in a foundation layer, it shall be based on the following methods. That is, particle diameter of a metal oxide particle of within the limits with a length [in an electron microscope photograph acquired by expanding a section of a photocatalyst body by 50,000 times with an electron microscope, and taking a photograph of it] of 5 cm is measured from a photograph, and particle size distribution is searched for. It is considered as mean particle diameter with particle diameter of a peak in particle size distribution. If a metal oxide particle of two or more sorts of mean particle diameter is being mixed in a foundation layer, two or more peaks will appear. although this method has the tendency for mean particle diameter obtained to become small a little from actual mean particle diameter, it is alike in general, and it is set, and shows good correlation.

[0047]Then, in this invention, since mean particle diameter from which a metal oxide particle of a foundation layer differs in two or more sorts is mixed, a film of a foundation layer becomes precise and film strength of a foundation layer improves. And since a metal oxide particle is exposed and porosity unevenness is formed at least on the surface of a foundation layer, adhesion of photocatalyst membrane is performed good. Therefore, bond strength to a base of photocatalyst membrane improves.

[0048]A manufacturing method of a photocatalyst body of an invention of claim 3 aluminum, Zr, Si, Ti, A metal oxide particle with a mean particle diameter of 10-100 nm which consists of an oxide of a kind chosen from a group of Zn, Mg, Y, In, Sn, Ta, and Sb, or two or more sorts of metal, The 1st coating liquid adjusting process, and the; 1st coating liquid that adjusts the 1st coating liquid distributed in a fluid containing a binding material formation material and a solvent which form a binding material which makes Si compound a subject are applied on the surface of a base, A light catalytic metallic-oxide ultrafine particle which makes with a subject a titanium oxide ultrafine particle whose; mean particle diameter is smaller than mean particle diameter of a metal oxide particle of a foundation layer a foundation layer disposing process which dries and allocates a porosity surface at least foundation layer, It is characterized by providing a photocatalyst membrane disposing process which applies the 2nd coating liquid

adjusting process, and the; 2nd coating liquid that adjusts the 2nd coating liquid distributed in a fluid containing a binding material formation material and a solvent which form a room-temperature-setting nature binding material on a foundation layer of a base, dries and allocates photocatalyst membrane, and;.

[0049]This invention has specified a manufacturing method for manufacturing the photocatalyst body according to claim 1.

[0050]A concrete presentation will not be asked, if a binding material formation material in the 1st coating liquid forms a binding material which makes Si compound a subject when a foundation layer is formed. As a binding material formation material which forms a room-temperature-setting nature binding material, what was explained, for example in claim 1 can be used.

[0051]A binding material formation material in the 2nd coating liquid will not ask a concrete presentation, if a room-temperature-setting nature binding material is formed when photocatalyst membrane formation is carried out. For example, what was explained in claim 1 can be used.

[0052]After a base may form a foundation layer and photocatalyst membrane in what was manufactured as a functional body which is not provided with photocatalyst membrane by post-installation and forms a foundation layer and photocatalyst membrane by an interim phase of functional body manufacture, it may be a base which completed a functional body.

[0053]A manufacturing method of a photocatalyst body of an invention of claim 4 aluminum, Zr, Si, Ti, Consist of an oxide of a kind chosen from a group of Zn, Mg, Y, In, Sn, Ta, and Sb, or two or more sorts of metal, and by within the limits whose mean particle diameter is 10-100 nm. And the 1st coating liquid adjusting process, and the; 1st coating liquid that adjusts the 1st coating liquid distributed in a fluid containing a binding material formation material and a solvent which form a binding material which makes Si compound a subject for a metal oxide particle from which mean particle diameter differs in two or more sorts are applied on the surface of a base, A light catalytic metallic-oxide ultrafine particle which makes with a subject a titanium oxide ultrafine particle whose; mean particle diameter is smaller than mean particle diameter of a metal oxide particle of a foundation layer a foundation layer disposing process which dries and allocates a porosity surface at least foundation layer, It is characterized by providing a photocatalyst membrane disposing process which applies the 2nd coating liquid adjusting process, and the; 2nd coating liquid that adjusts the 2nd coating liquid distributed in a fluid containing a binding material formation material and a solvent which form a room-temperature-setting nature binding material on a foundation layer of a base, dries and allocates photocatalyst membrane, and;.

[0054]This invention has specified a manufacturing method for manufacturing the photocatalyst body according to claim 2. Namely, in order for mean particle diameter to

distribute a metal oxide particle which is different in two or more sorts in a fluid containing a binding material formation material and a solvent, It is good to it to make it distribute one by one in a fluid which may distribute in a fluid containing a binding material formation material and a solvent after mean particle diameter mixes beforehand a metal oxide particle which is different in two or more sorts, and contains a binding material formation material and a solvent.

[0055]Coating liquid for foundation layers of a photocatalyst body of an invention of claim 5, At least a kind of constituent chosen from a group who consists of organosilane oligomer containing the ORGANO mono silane and a methyl group containing a methyl group, Or a constituent which blended polysilazane and an oxidation catalyst with an organic solvent which does not have an OH radical, And it is characterized by containing a metal oxide particle which it makes it come to distribute in a binding material solution which blended at least a kind of oxidation catalyst chosen from a group who consists of acid, alkali, a zinc compound, a titanium compound, and a zirconium compound, and; binding material solution, and;.
[0056]This invention has specified a presentation of coating liquid for foundation layers of room-temperature-setting nature which can be used when manufacturing the photocatalyst body according to claim 1 or 2.
[0057]Then, the surface can form easily a foundation layer of a photocatalyst body with large bond strength of photocatalyst membrane by porosity at least only by applying coating liquid for foundation layers of this invention on the surface of a base, and calcinating it in 15-300 **.
[0058]At least a kind of constituent chosen from a group who consists of organosilane oligomer containing the ORGANO mono silane and a methyl group in which coating liquid for photocatalyst membrane of an invention of claim 6 contains a methyl group, Or a constituent which blended polysilazane and an oxidation catalyst with an organic solvent which does not have an OH radical, And it is characterized by containing a titanium oxide ultrafine particle which it makes it come to distribute in a binding material solution which blended at least a kind of oxidation catalyst chosen from a group who consists of acid, alkali, a zinc compound, a titanium compound, and a zirconium compound, and; binding material solution, and;.
[0059]This invention has specified a presentation of coating liquid for photocatalyst membrane of room-temperature-setting nature which can be used when manufacturing the photocatalyst body according to claim 1 or 2.
[0060]Then, photocatalyst membrane with large bond strength to a foundation layer of photocatalyst membrane can be easily formed only by applying coating liquid for photocatalyst membrane of this invention to the surface of a foundation layer of a base, and calcinating it in 15-300 **.
[0061]A functional body of an invention of claim 7 is characterized by providing a functional body main part, the photocatalyst body according to claim 1 or 2 formed as a base in at least a

part of; functional body main part, and;.

[0062]In this invention, a "functional body" is as explanation in claim 1. And this invention can be adapted for all the members that have a certain function.

[0063]A "functional body main part" means a part or the whole of a portion except photocatalyst membrane among functional bodies. For example, photocatalyst membrane will be formed in a part of functional body main part, if a portion of the usual tile is called functional body main part in this invention and photocatalyst membrane is formed in a front face of a tile, when a functional body is a tile.

[0064]When a functional body is a lamp, the photocatalyst membrane can form photocatalyst membrane in an outside surface of a glass bulb of a lamp. A luminescence principle will not be asked, if a glass bulb is surrounding a light-emitting part and a lamp contains wavelength of 400 nm or less. For example, it permits that they are a filament lamp, a discharge lamp, etc. In the case of a filament lamp, the tungsten halogen lamp with a high color temperature has a luminescence rate with a wavelength of 400 nm or less higher than electric lamps for general lighting. In the case of a discharge lamp, any of a low-pressure discharge lamp and a high-pressure discharge lamp may be sufficient. As a low-pressure discharge lamp, there is a fluorescent lamp, for example. If it requires, a fluorescent substance to be used can be chosen and luminescence of 400 nm or less can be made to increase suitably in the case of a fluorescent lamp. Since such a fluorescent lamp has much ultraviolet quantity which there is comparatively little reduction in visible light, and moreover irradiates with a photocatalyst body as compared with a fluorescent lamp for general lighting, it can enlarge resolving power. For this reason, it is suitable as a lamp for photocatalyst body activation. However, it may be a fluorescent lamp using a fluorescent substance and a halo phosphate fluorescent substance of three-wave type luminescence which are used abundantly from the former as an object for general lighting. They may be a bactericidal lamp to mainly use luminescence of 400 nm or less, a black light, a chemical lamp, etc. On the other hand, as a high-pressure discharge lamp, they may be a mercury lamp, a metal halide lamp, a high-pressure sodium lamp, etc., for example. A glass bulb may be an arc tube which is surrounding a discharge medium, and may be an outer tube which surrounds further an arc tube which has included a light-emitting part. As mentioned above, while luminescence of a lamp performs indoor lighting, it can deodorize by activating photocatalyst membrane and decomposing stinking gas by ultraviolet rays under luminescence. since photocatalyst membrane is especially allocated by position whose ultraviolet ray intensity is high in the case of a lamp -- photocatalyst membrane -- the whole can be activated mostly good and strong deodorization can be performed.

[0065]Next, also when a functional body is a light, since a light is used in a position close to a lamp which is an ultraviolet-rays source of release, it can activate photocatalyst membrane good with strong ultraviolet ray intensity. A portion of a dimmer is preferred for a part which

forms photocatalyst membrane among lights. A dimmer may be plural [which consists of combination of 1 or arbitrary numbers, such as way ** for a reflector, a glove, shade, a translucent cover, and chandeliers and a louver,]. Since a dimmer controls luminescence of a lamp and it is irradiated also with ultraviolet rays of a lamp by dimmer in order to obtain desired luminous intensity distribution and how to be visible, By forming photocatalyst membrane in this portion, it is effective for being able to activate photocatalyst membrane to necessary, therefore decomposing stinking gas, and deodorizing. And since stinking gas is decomposed by photocatalyst membrane, indoor deodorization is performed effectively. Deodorization is possible in apparatus by making it a size and structure which can store a light to a refrigerator, an air conditioner, an air cleaner, etc., and allocating in these apparatus.

[0066]Then, in this invention, even if it becomes dirty to a part which forms photocatalyst membrane and bacteria or a stinking substance adheres while using a functional body, when photocatalyst membrane receives UV irradiation, these are decomposed and removed.

[0067]Since a foundation layer can also be formed by room temperature setting if photocatalyst membrane is required further, photocatalyst membrane can be formed in a functional body of inflammable construction material, such as a curtain, wallpaper, and wood. Therefore, construction material of a part which forms photocatalyst membrane of a functional body is not chosen.

[0068]Since it can form on the spot if photocatalyst membrane is required also to a functional body in use, an application range of photocatalyst membrane can be raised by leaps and bounds.

[0069]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described with reference to drawings.

[0070]Drawing 1 is a notional important section expanded sectional view expanding and showing the section of the photocatalyst membrane in a 1st embodiment of the photocatalyst body of this invention.

[0071]As for 1, in a figure, a foundation layer and 3 are photocatalyst membrane a base and 2.

[0072]The > base 1 is constituted from soda lime glass by the < base 1.

[0073]The > foundation layer 2 binds the silicon oxide particle 2a with a mean particle diameter of 40 nm with room-temperature-setting nature binding material 2b which makes Si compound a subject about the < foundation layer 2. While binding material 2b is 15 % of the weight in SiO_2 conversion and being porosity in transparency, the surface is the tunic formed in the rugged surface which is an average depth of about 20 nm.

[0074]About the < photocatalyst membrane 3, the > photocatalyst membrane 3 makes the ultrafine particle 3a of the titanium oxide which makes a subject an anatase form with a mean

particle diameter of about 7 nm bind with the room-temperature-setting nature binding material 3b which makes Si compound a subject on the foundation layer 2, and is formed with it. The binding material 3b is 10 % of the weight in SiO_2 conversion. And the photocatalyst membrane 3 entered the rugged surface formed in the surface of the foundation layer 2, and is stuck to the foundation layer 2.
[0075]Drawing 2 is a notional important section expanded sectional view showing a 2nd embodiment of the photocatalyst body of this invention.
[0076]In a figure, identical codes are attached about drawing 1 and identical parts, and explanation is omitted.
[0077]These embodiments differ in that the organic system coloring matter 4 is distributing to the photocatalyst membrane 3.
[0078]Drawing 3 is a notional important section expanded sectional view showing a 3rd embodiment of the photocatalyst body of this invention.
[0079]In a figure, identical codes are attached about drawing 1 and identical parts, and explanation is omitted.
[0080]These embodiments differ in that there are two kinds of mean particle diameter of the metal oxide particle in the foundation layer 2.
[0081]That is, the foundation layer 2 is in the state which the $aluminum_2O_3$ particle two a1 with a mean particle diameter of 15 nm and the $aluminum_2O_3$ particle two a2 with a mean particle diameter of 55 nm mixed as a metal oxide particle, is bound with room-temperature-setting nature binding material 2b, and is formed. The particle size distribution is about **5 nm in half breadth also the $aluminum_2O_3$ particles two a1 of which mean particle diameter, and two a2.
[0082]Drawing 4 is an important section section part notch front view showing the fluorescent lamp as a 1st embodiment of the functional body of this invention.
[0083]As for photocatalyst membrane and 13, in a figure, 11 is [a filament electrode and 15] caps a fluorescent substance layer and 14 a glass bulb and 12.
[0084]The glass bulb 11 stores the functional division as a fluorescent lamp airtightly inside while functioning as a base to the photocatalyst membrane 12. That is, the hundreds of Pa rare gas which makes a subject mercury and argon as a discharge medium was enclosed with the inside of the glass bulb 11, the fluorescent substance layer 13 was supported inside, and the filament electrode 14 of a couple is further sealed in both ends.
[0085]The cap 15 comprised the tube pin 15b of the couple insulated and attached to the mouthpiece body 15a and the mouthpiece body 15a of cap shape made from aluminum, and is pasted up on the both ends of the glass bulb 11. The both ends of the filament electrode 14 are connected to the tube pin 15b, respectively.
[0086]Then, if it illuminates using the fluorescent lamp which is a functional body of this

embodiment, the organic quality of dirty things which adhered on the surface of the fluorescent lamp will be decomposed by the photocatalyst effect of the photocatalyst membrane 12, the stinking substance in the air which contacted will be disassembled, and the surrounding deodorization will be performed by it.

[0087]Drawing 5 is a notional sectional view showing the light for a tunnel as a 2nd embodiment of the functional body of this invention.

[0088]As for a translucency glass cover and 24, in a figure, a lighting fitting body and 22 are [a high-pressure discharge lamp and 26] light reflectors a lamp socket and 25 a front frame and 23 21.

[0089]The lighting fitting body 21 fabricated the stainless plate to the case shape which equipped the front face with the opening, and is provided with attachment lug which is not illustrated at the back.

[0090]The front frame 22 fabricated the stainless plate, and light projection opening and 1 side is equipped with a hinge, and it is provided with the latch (neither is illustrated.) in the center at other sides. And it is pivoted in the one side part by the side of the front face of the lighting fitting body 21 by a hinge, enabling free opening and closing, and it is constituted so that it may be fixed to a closing position by latch.

[0091]It is equipped with the translucency glass cover 23 in water proof via the packing made of silicone rubber which is not illustrated in the front frame 22. This translucency glass cover 23 has the at least in part comparatively high transmissivity characteristic of an ultraviolet region with a wavelength of 400 nm or less while penetrating visible light. The photocatalyst membrane shown in drawing 1 is formed in the front face of the translucency glass cover 23.

[0092]The lamp socket 24 is allocated in the lighting fitting body 21.

[0093]The high-pressure discharge lamp 25 emits the ultraviolet rays of the intensity beyond 0.05W to wavelength within the limits of 340-400 nm per light flux 1000lm of visible light.

[0094]The light reflector 26 is allocated in the lighting fitting body 21, and it is constituted and it is arranged so that the light emitted from the above-mentioned high-pressure discharge lamp 25 may be reflected with the light reflector 26 and a necessary lighting distribution characteristic may be shown.

[0095]A stabilizer, a terminal block, etc. are allocated in the back side of the light reflector 26 of the lighting fitting body 21.

[0096]Then, the functional body of this embodiment is installed in a tunnel via attachment lug, and use is presented with it, and it illuminates the inside of a tunnel.

[0097]Since it emanates from the high-pressure discharge lamp 25 simultaneously with lighting, and it mainly concerns, and the ultraviolet rays of wavelength within the limits of 340-400 nm also pass the translucency glass cover 23 together with visible light and enter into photocatalyst membrane, Ultraviolet rays are activated, and photocatalyst membrane

disassembles the dirt of organic matters, such as adhering smoke, and performs self-cleaning.
[0098]
[Effect of the Invention]According to the invention of claim 1, the allocated foundation layer on the surface of a base aluminum, Zr, it comes to bind the metal oxide particle chosen from the group of Si, Ti, Zn, Mg, Y, In, Sn, Ta, and Sb with the binding material which makes Si compound a subject, while the surface is porosity at least, The photocatalyst membrane allocated on a foundation layer binds the light catalytic metallic-oxide ultrafine particle which makes a subject the ultrafine particle of titanium oxide whose mean particle diameter is smaller than the metal oxide particle of a foundation layer with a room-temperature-setting nature binding material, and, [things] While it hardens at ordinary temperature and manufacture can form photocatalyst membrane in easy various bases, the photocatalyst body provided with light catalytic [high] and high film strength and high bond strength can be provided.
[0099]According to the invention of claim 2, the photocatalyst body whose bond strength of photocatalyst membrane whose film strength of the foundation layer improved and improved in connection with this can be provided by binding with the room-temperature-setting nature binding material, where the metal oxide particle from which mean particle diameter differs in two or more sorts in addition is mixed.
[0100]According to the invention of claim 3, by providing the 1st coating liquid adjusting process, a foundation layer disposing process, the 2nd coating liquid adjusting process, and a photocatalyst membrane disposing process, If the photocatalyst body which has an effect of claim 1 is moreover required easily, a base can be manufactured even at the spot currently used as a functional body.
[0101]By distributing the metal oxide particle from which mean particle diameter differs in two or more sorts in the 1st coating liquid adjusting process in addition in the fluid containing a binding material distribution formation material and a solution according to the invention of claim 4, If the photocatalyst body which has an effect of claim 2 is moreover required easily, a base can be manufactured even at the spot currently used as a functional body.
[0102]The constituent which blended polysilazane and an oxidation catalyst with the organic solvent which does not have at least a kind of constituent chosen from the group who consists of organosilane oligomer which contains the ORGANO mono silane and methyl group containing a methyl group according to claim 5, or an OH radical and acid, alkali, By containing the binding material solution which blended at least a kind of oxidation catalyst chosen from the group who consists of a zinc compound, a titanium compound, and a zirconium compound, and the metal oxide particle distributed in the binding material solution, the coating liquid for foundation layers of the photocatalyst body in which the surface can form easily the foundation layer of a photocatalyst body with large bond strength of photocatalyst membrane by porosity at least only by applying on the surface of a base and calcinating in 15-300 ** -- offer -- things

are made.
[0103]At least a kind of constituent chosen from the group who consists of organosilane oligomer which contains the ORGANO mono silane and methyl group containing a methyl group according to the invention of claim 6, Or the constituent which blended polysilazane and an oxidation catalyst with the organic solvent which does not have an OH radical, And the binding material solution which blended at least a kind of oxidation catalyst chosen from the group who consists of acid, alkali, a zinc compound, a titanium compound, and a zirconium compound, By containing the titanium oxide ultrafine particle which it makes it come to distribute in a binding material solution, it can apply to the surface of the foundation layer of a base, and the coating liquid for photocatalyst membrane which can form easily photocatalyst membrane with large bond strength to the foundation layer of photocatalyst membrane can be provided only by calcinating in 15-300 **.
[0104]According to the invention of claim 7, the functional body which has an effect of claims 1 and 2 can be provided.

[Translation done.]